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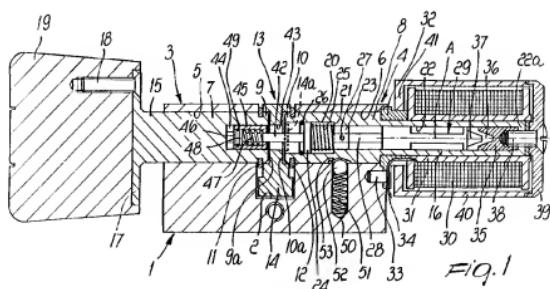
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 Lock with electric activation.

② The lock with electrical activation can be inserted in the place of a conventional cylinder lock. The lock includes an electromagnet (30) accommodated in the internal handgrip (40) and activatable from outside to operate an engagement system which produces the rotary coupling of the external handgrip (19) to the bit (13). The internal handgrip is always rigidly associated in rotation with the bit for actuating a spring latch and/or a bolt, by means of radial expansions (14a), accommodated in complementary shaped slots of a depression (10a) of the bit (13), of a plug (8) rotatably accommodated in a cylindrical seat (6) of the lock body (1) and provided

with an extending tang (16) which is rigidly coupled to the internal handgrip. The engagement system for the external handgrip includes a sliding block (45) with an external polygonal cross-section which slides into aligned polygonal cross-section holes (43 and 44), the first (43) of which is provided in the bit (13) and the second (44) of which is provided in a plug (7) rigidly connected to the external handgrip (19) and rotationally accommodated in a cylindrical seat (5) of the body. The block (45) moves with a sliding keeper (29) arranged inside the electromagnetic windings (30).



The present invention relates to a cylinder lock with a handgrip which can be coupled to a bit by means of an electrical command.

As is known, there is the problem of activating a lock by sending a coded command signal which activates electromechanical means suitable to open the lock. This can occur by means of an electromagnet or of an electric motor which directly actuates the bolt and/or the spring latch into their open position. According to another method of operation, the electromagnet actuates an engagement device which, after being deactivated, allows to manually operate the lock.

A principal object of the present invention is to provide a lock of the indicated type which differs from known ones in that it can be easily installed in the place of a conventional cylinder lock, so as to allow to convert a door with manually-operating opening into another door with electrically-operated opening without appreciable interventions on the door, particularly without having to replace the entire lock.

Within the scope of this aim, another object of the present invention is to provide a lock which is provided with an emergency opening device if the electrical power supply fails or if a malfunction occurs which disables the electrical part.

With these and other objects in view, there is provided, in accordance with the invention, a lock with electric activation, characterized in that it comprises a profiled body suitable to be inserted in a complementarily shaped seat of the door and is provided with a transverse recess and with two cylindrical seats which extend coaxially from said recess and wherein an internal plug and an external plug are rotatably supported, said plugs being provided with respective tangs which extend out of the seats toward the internal and external sides of the door and with which an inner handgrip and an outer handgrip for the actuation of the lock are respectively rigidly associated, the contiguous ends of said plugs extending into said recess and supporting a bit which is provided with a polygonal axial opening, the end of the internal plug being rotationally coupled to said bit, a stem being axially guided in said internal plug, one end of said stem being connected to a keeper of an electromagnet mounted on said internal tang, the opposite end of said stem being elastically connected, through said polygonal opening, to an element which provides an axially sliding and rotationally fixed insertion in a hole of the external plug, the activation of said electromagnet being suitable to produce, in contrast with elastic return means, the side-fitting engagement of said insertion element in the opening of said bit and the rotational coupling of said bit with the external plug.

Further advantages and characteristics of the present invention will become apparent from the following detailed description of two preferred embodiments thereof, on the basis of the accompanying drawings, wherein:

- 5 figure 1 is a longitudinal sectional view of a first embodiment of the lock according to the invention; and
10 figure 2 is a longitudinal sectional view of a further embodiment of the lock according to the invention.

With reference to figure 1, the lock comprises a profiled body 1, the cross-section whereof is fully identical to that of a conventional cylinder to be inserted.

A recess 2 is formed in the body 1 transversely to its longitudinal extension and divides it into two portions 3 and 4, in which two cylindrical seats 5 and 6 are defined; said seats are mutually coaxial along the longitudinal axis A of the body and lead into the recess 2.

Two respective plugs 7 and 8 are rotatably accommodated within the seats 5 and 6, and their adjacent ends 9 and 10 protrude into the recess 2 and remain mutually spaced.

Two rings 11 and 12, inserted in outer annular grooves of the ends 9 and 10, prevent the extraction of the plugs 7 and 8 from the seats 5 and 6. The ends 9 and 10 engage in mutually opposite depressions 9a and 10a of a bit 13 which is supported between them. The bit 13 has a radial expansion 14 which actuates the spring latch and/or the bolt of a lock. Whereas the plug 7 is normally free to rotate with respect to the bit 13 in the depression 9a, the plug 8 is constantly rotationally coupled to the bit 13 by means of diametrically opposite radial expansions 14a of the end 10, which engage in corresponding complementary seats of the depression 10a of the bit 13.

40 The plugs 7 and 8 extend outside the respective portions 3 and 4 with two tangs 15 and 16. The tang 15 is provided with a flange 17 for fixing, by means of screws 18, a knob 19 which constitutes the handgrip for operating the lock from outside.

45 The plug 8 is axially crossed by a cylindrical seat 20 which, by means of a shoulder 21, is separated from a hole 22 which extends coaxially in the tang 16 and makes said tang substantially tubular; said tang ends with an internal collar 22a.

50 A piston 23 is guided in the hole 22 proximate to the shoulder 21 and is provided with an annular expansion 24 which is guided in the seat 20. The annular expansion 24 has a larger diameter than the piston 23 in order to allow the accommodation of a spring 25 which acts between the expansion 24 and the shoulder 21 and keeps the expansion 24 in abutment against a ring 26 which is inserted in an annular groove of the seat 20.

The stem 28 of a slider 29 is connected to the piston 23 by means of a diametrical pin 27; said slider 29 constitutes the keeper of an electromagnet, the winding 30 whereof is arranged cylindrically around the tang 16.

Energization of the electromagnet occurs for example by means of a coded command which connects the winding 30 to a power supply in a conventional manner.

The winding 30 is provided with a spool 31 in which the tang 16 can rotate freely; said spool is rigidly coupled to the portion 4 by means of a connecting bush 32. The bush 32 is provided with a rotation-preventing pin 33, which is frontally inserted in the body 1, and with a channel for the wires 34 for the supply of power to the winding.

The slider 29 can move between two stroke limits which are determined by the ring 26 and by an abutment 35, which is made of ferromagnetic material.

The abutment 35 is arranged at the external end of the hole 22 and has a concavity 36 which is complementary to the wedge-shaped head 37 formed at the end of the keeper 29.

A screw 38 engages in the abutment 35 and is driven through the internal collar 22a by means of which a disk 39 is fixed to the tang 16. A sleeve 40 is centered and fixed on the disk 39 and is provided with an internal collar 41 at the end opposite to the disk. The sleeve 40 externally covers the winding 30 and constitutes the handgrip for the actuation of the lock from the internal side of the door. The screw 38, the disk 39, the sleeve 40 and the bush 32 are made of ferromagnetic material in order to allow to converge the magnetic lines of force onto the keeper 29. For the same reason, the tubular tang 16 is made of diamagnetic material, for example brass.

The lock furthermore comprises a stem 42 which extends axially from the piston 23 through an opening 43 of the bit 13.

The opening 43 is coaxial to the axis A and has a polygonal, for example hexagonal, cross-section. A dead hole 44 is formed in the plug 7, is aligned with the opening 43 of the bit and has the same cross-section as the opening 43. An insertion-coupling element is guided in the dead hole 44 and is constituted by a prism-shaped block 45 the external cross-section of which is identical and complementary to the cross-section of the hole 44 and opening 43. In this manner, the block 45 can slide coaxially but is rotationally coupled with respect to the plug 7, and can enter the opening 43 to provide a rotational coupling between the bit 13 and the plug 7. The block 45 has an internal cylindrical cavity 46 wherein the stem 42 extends. The cavity 46 has a larger diameter than the stem, so that a chamber for a spring 47 is formed. The spring 47

rests at one end against an internal shoulder of the block 45 and at the opposite end against a collar 48 formed at the end of the stem 42, so as to keep said collar in abutment against a ring 49 arranged inside the cavity in a position in which the block 45 does not engage the opening 43 of the bit.

The operation of the described lock is as follows.

The lock is normally in the position shown in figure 1 and can be actuated only by acting by means of the internal handgrip 40, the plug 8 of which, by being constantly engaged in the bit 13 by means of the radial expansions 14a, allows the rotation of said bit. Instead, when one acts on the external knob 19, the bit does not move, since the block 45 is disengaged from the opening 43 and the end 9 is free to rotate within the related depression 9a of the bit 13.

However, when one wishes to operate the lock from outside, by sending an appropriate signal the electromagnet 30 is activated, and its keeper 29 is attracted against the abutment 35, overcoming the elastic force of the spring 25. Consequently, the insertion-coupling element 45 engages in the opening 43, rotationally mutually joining the plug 7 and the bit 13 and allowing their actuation when the knob 19 is rotated.

As soon as the action of the electromagnet 30 ends, the spring 25 pushes the stem 42 back toward the cavity 44, disengaging the block 45 from the opening 43 and retracting it into the cavity 44, so that the knob 19 can only rotate idle and remains ineffective.

Conveniently, in order to keep the bit 13 in a preset orientation, a hole 50 is formed in the body 1 and ends in the seat 6, in which a spring 51 and a ball 52 are accommodated. The spring 51 pushes the ball 52 into a notch 53 formed in the outer surface of the plug 8, so as to retain it elastically against rotations.

It should be noted that when the knob 19 is rotated in an angular position wherein the prism-shaped cavity 44 is not aligned with the opening 43, activation of the electromagnet does not cause the immediate insertion of the block 45 in the opening. In this case, the block 45 abuts against the bottom of the depression 9a and the spring 47 is compressed; said spring causes the insertion of the block 45 in the opening 43 as soon as alignment is resumed by turning the knob 19.

Figure 2 illustrates an embodiment of the described lock which is modified in order to allow emergency intervention from outside. In this embodiment, the tang 15 is rotationally rigidly coupled to the plug 54 of a conventional cylinder lock 55 with pins and tumbler pins, the body 56 whereof is accommodated in a seat 57 of the knob 19.

A pin 58, radially inserted in the body 56, engages an annular groove 59 formed between the plug 54 and the tang 15 and prevents the extraction of the plug from the body 56.

Retention of the body 56 in the seat 57 is provided by means of an annular element 60 fixed by means of screws 61 to the face of the knob which is directed toward the body 1.

A sleeve 62 extends from the body 56 coaxially to the plug 54 and is superimposed on the tang 15. The sleeve 62 comprises a portion which extends into an annular seat 63 of the body 1 and has a slot 64 which extends helically around the plug 7.

A dead hole 65 is formed in the plug 7 and constitutes an axial extension of the hole 44. A mushroom-shaped pin 66 is slidably guided in the hole 65 and can act on the stem 42 with one end.

The enlarged part of the pin 66 is crossed by a diametrical dowel 67 which also passes through the plug 7 at a longitudinal slot 68. Through said slot, the end of the dowel 67 protrudes outside the plug 7 and engages in the helical slot 64.

The illustrated lock normally operates like the lock described earlier with reference to figure 1. In fact, since the plug 54 is rotationally coupled to the body 56 by means of the pins and tumbler pins, and since the body 56 is rotationally rigidly coupled to the outer knob 19, the plug 7 can be rotationally coupled to the bit 13 only by inserting the element 45 in the opening 43 of the bit, i.e. only when the electromagnet 30 is activated.

On the other hand, when one wishes to operate the lock from outside, without activating the electromagnet 30, for example due to an emergency, one inserts the key in the plug 54 so as to allow said plug 54 to rotate with respect to the body 54 and ultimately with respect to the knob 19. In this manner, by turning the knob 19 and at the same time preventing the rotation of the plug 54 by blocking the key inserted therein, it is possible, by means of the helical slot 64, to impart to the dowel 67 an axial movement which produces the movement of the element 45 into the position for entering the opening 43 and produces, as rotation continues, the actuation of the bit.

As can be seen, the lock according to the invention allows to achieve the intended objects. A fundamental prerogative is constituted by the fact that the mechanical elements are accommodated in a body 1 which is fully identical to that of conventional plugs, so that it is possible to replace said plugs with a simple operation without having to perform further adaptations of the door.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims

and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

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Claims

1. Lock with electric activation, characterized in that it comprises a profiled body (1) suitable to be inserted in a complementarily shaped seat of the door and provided with a transverse recess (2) and with two cylindrical seats (5, 6) which extend coaxially from said recess and in which an internal plug (8) and an external plug (7) are rotatably supported, said plugs being provided with respective tangs (16, 15) which extend out of the seats toward the internal and external sides of the door and with which an inner handgrip (40) and an outer handgrip (19) for the actuation of the lock are respectively rigidly associated, the contiguous ends of said plugs (7, 8) extending into said recess (2) and supporting a bit (13) provided with a polygonal axial opening (43), the end of the internal plug (8) being rotationally coupled to said bit (13), a stem (42) being axially guided in said internal plug (8), one end of said stem being connected to a keeper (29) of an electromagnet mounted on said internal tang (8), the opposite end of said stem (42) being elastically connected, through said polygonal opening (43), to an element (45) which provides an axially sliding and rotationally fixed insertion in a hole (44) of the external plug (7), the activation of said electromagnet being suitable to produce, in contrast with elastic return means (25), the side-fitting engagement of said insertion element (45) in the opening (43) of said bit (13) and the rotational coupling of said bit with the external plug (8).
2. Lock according to claim 1, characterized in that said internal tang (16) is tubular and a coupling disk (39) for a sleeve (40) is rigidly coupled to its end, said sleeve containing the winding (30) of said electromagnet, said keeper (29) being able to slide within said tang (16).
3. Lock according to claim 1 or 2, characterized in that said stem (42) is axially rigidly coupled to a piston (23) which is provided with an annular expansion (24) and is guided in a coaxial cylindrical seal (20) of said internal plug (8), and in that said elastic return means are constituted by a spring (25) which is interposed between said annular expansion (24) and a shoulder (21) of said coaxial cylindrical

seat (20).

4. Lock according to any of claims 1 to 3, characterized in that said insertion element is constituted by a prism-shaped block (45) the cross-section whereof is complementary to that of the polygonal opening (43) or the bit (13) and of the hole (44) for accommodation in the external plug (7), which has an internal cylindrical cavity (46) in which the end of said stem (42) connected to the keeper (29) extends, a spring (47) being provided which acts between a shoulder of said block (45) and a collar (48) of said stem (42) so as to keep said collar (48) in abutment against a ring (49) which is arranged inside said cavity (46) in a position in which said block (45) does not engage the polygonal opening (43) of said bit (13).
5. Lock according to any of the preceding claims, characterized in that a hole (50) is formed in said body (1) for the accommodation of a spring-loaded ball (52) suitable to engage a peripheral notch (53) of said internal plug (8) in order to keep said internal plug at a preset angular orientation.
6. Lock according to any of the preceding claims, characterized in that said winding (30) is provided with a spool (31) in which said tubular tang (16) can rotate freely; said spool is rigidly coupled to said body (1) by a bush (32) which is provided with rotation-preventing means (33) and with passages for the power supply wires (34) of said winding (30), said bush (32), said sleeve (40) and said disk (39) being made of ferromagnetic material, said tubular tang (16) being made of diamagnetic material.
7. Lock according to any of the preceding claims, characterized in that it comprises emergency operation means which comprise a cylinder lock (55) accommodated in the outer handgrip (19), the plug (54) of said lock (55) being coaxially rigidly coupled to the external tang (7), a sleeve (62) extending from the body (56) of said lock (55), said sleeve (62) being superimposed on said tang (15) and having at least one slot (64) which extends helically around said external plug (7), a hole (65) being furthermore provided in said external tang (15) and being coaxially connected to the accommodation hole (46) of said insertion element (45), a pivot (66) being able to slide in said hole (46), said pivot (66) being crossed by a diametrical dowel (67) an end whereof engages in said helical slot (64) through a longitudinal slot (68) of said accommodation hole (65), said pivot

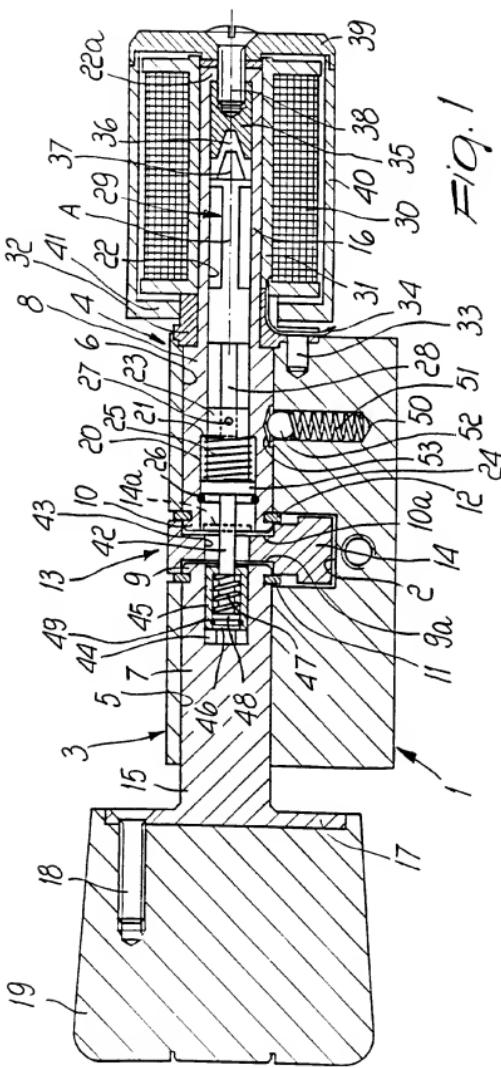
(66) having an end which is operatively associated with said stem (42) so that when said cylinder lock (55) is released by means of the key, the actuation of said handgrip (19) produces the rotation of said sleeve (62), the axial movement of said dowel (67) and of the pivot (66) which is rigidly associated therewith against said stem (42), and the insertion of said insertion element (45) in said opening (43) of the bit (13).

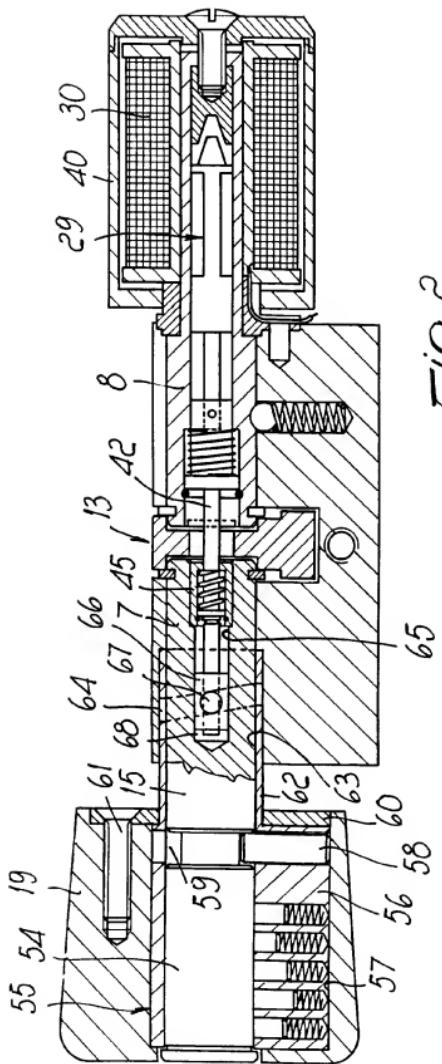
8. Lock with electrical activation comprising:

- a profiled body (1) with a longitudinal extension (A) for insertion in a door;
- a bit element (13) rotationally carried by said profiled body for engagement with a spring latch and/or a bolt;
- an internal handgrip (40) rotationally carried at a first side (4) of said profiled body (1);
- an external handgrip (19) rotationally carried at a second side (3) of said profiled body (1);
- first connecting means (8,14a) for rigidly connecting said internal handgrip to said bit element; and
- second connecting means (45) for rigidly connecting said external handgrip to said bit element,

said second connecting means comprising:

- a first polygonal opening (43) provided in said bit element (13) and extending along said longitudinal extension (A);
- a second polygonal opening (44) provided in said external handgrip extending along said longitudinal extension and aligned with said first opening, said first and second openings having substantially equivalent sized polygonal cross-sections;
- a polygonal block element (45) having an external polygonal cross-section which is slightly smaller than the polygonal cross-sections of said first and second openings, said block element being slideable between a first position in which said block element engages in both of said first and second openings, and a second position in which said block element engages in only one of said first and second openings; and
- electromagnetic means (29,30) for moving said block element between said first and second positions.







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EUROPEAN SEARCH REPORT

Application Number
EP 93 11 4317

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)						
A	US-A-5 040 391 (LIN) * the whole document *	1-3,6,8	E05B47/06						

A	US-A-4 736 970 (MC GOURTY)	1-3,6,8							

A	US-A-3 894 417 (TANIYAMA) * the whole document *	1-3,6-8							

A	FR-A-2 554 858 (INNOVATION TECHNIQUE SAM) * figures 1,5,6 *	1,2,5-8							

			TECHNICAL FIELDS SEARCHED (Int.Cl.5)						
			E05B						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>14 December 1993</td> <td>Teerling, J</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	14 December 1993	Teerling, J
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THE HAGUE	14 December 1993	Teerling, J							
CATEGORY OF CITED DOCUMENTS									
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